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HS-803 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES  
IN THE UNITED STATES

First Series - Report No. 18  
1976 Ford 400 CID (6.6 Liters), 2V

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Washington DC 20590

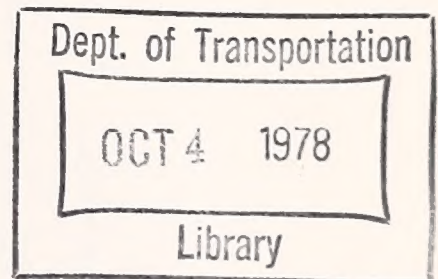
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16. Abstract  Experimental data were obtained in dynamometer tests of a 1976 Ford 400 CID, 2V engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady-state engine-operating modes. The objective of the program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.					
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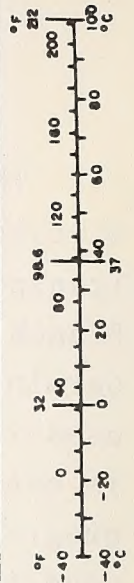
This report, prepared by the U.S. Department of Energy, Bartlesville Energy Research Center, for the U.S. Department of Transportation, Transportation Systems Center, Energy Technology Branch, Cambridge MA, presents results of experimental work to obtain information on performance characteristics of an engine used in automobiles sold in the U.S. The engine used in this work is one of a series of 23 engines to be tested in the current program. This is the eighteenth of the reports to be published covering work with those engines.

This project is funded by the National Highway Traffic Safety Administration, Office of Research and Development, Office of Passenger Vehicle Research, Technology Assessment Division.

Ralph G. Colello and James A. Kidd, Jr., of the U.S. Department of Transportation, Transportation Systems Center, are the technical monitors.

# METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures				Approximate Conversions from Metric Measures			
Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find
<b>LENGTH</b>				<b>LENGTH</b>			
in	inches	2.5	centimeters	mm	millimeters	0.04	inches
ft	feet	30	centimeters	cm	centimeters	0.4	inches
yd	yards	0.9	meters	m	meters	3.3	feet
mi	miles	1.6	kilometers	km	kilometers	1.1	yards
						0.6	miles
<b>AREA</b>				<b>AREA</b>			
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>	square centimeters	0.16	square inches
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>	square meters	1.2	square yards
yd <sup>2</sup>	square yards	0.8	square meters	km <sup>2</sup>	square kilometers	0.4	square miles
mi <sup>2</sup>	square miles	2.6	square kilometers	ha	hectares (10,000 m <sup>2</sup> )	2.5	acres
	acres	0.4	hectares				
<b>MASS (weight)</b>				<b>MASS (weight)</b>			
oz	ounces	28	grams	g	grams	0.035	ounces
lb	pounds	0.45	kilograms	kg	kilograms	2.2	pounds
	short tons (2000 lb)	0.9	tonnes	t	tonnes (1000 kg)	1.1	short tons
<b>VOLUME</b>				<b>VOLUME</b>			
tsps	teaspoons	5	milliliters	ml	milliliters	0.03	fluid ounces
Tbsp	tablespoons	15	milliliters	l	liters	2.1	pints
fl oz	fluid ounces	30	milliliters	l	liters	1.06	quarts
c	cups	0.24	liters	l	liters	0.26	gallons
pt	pints	0.47	liters	m <sup>3</sup>	cubic meters	35	cubic feet
qt	quarts	0.95	liters	m <sup>3</sup>	cubic meters	1.3	cubic yards
gal	gallons	3.8	liters				
cu ft	cubic feet	0.03	cubic meters				
yd <sup>3</sup>	cubic yards	0.76	cubic meters				
<b>TEMPERATURE (exact)</b>				<b>TEMPERATURE (exact)</b>			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature



## 1. INTRODUCTION

This report presents data acquired from tests of a 1976 Ford 400 CID, 2V engine. Ford uses this engine in Ford and Mercury full-size vehicles (Custom, LTD, etc.). The test results are sufficient to establish steady-state maps for engine performance, fuel consumption, and emission rates (carbon monoxide, unburned hydrocarbon, and oxides of nitrogen) over the entire operating range of the engine.

The objective of the program is to provide engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of this work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.

## 2. ENGINE TEST REPORT

General engine specifications for the Ford 400 CID, 2V engine are given in table 1. The engine break-in (table 2) and tests were run using a single batch of unleaded regular grade gasoline; a fuel analysis is given in table 3.

The engine break-in and tests were conducted with a new mean-tolerance engine mounted on a test stand and coupled to an eddy-current dynamometer. The engine was complete with the exception of a fan, and a cooling tower was used in place of the radiator. The engine was equipped with an alternator, but it was not wired into the engine's electrical system. The operative emission control systems included an oxidation catalyst, exhaust-gas-recirculation (EGR), and air injection.

The engine was operated at various speeds and loads designed to approximate road-load conditions over a 45-hour period for break-in (see table 2). The engine tests began on 25 May, and ended on 17 June 1976, giving a total engine operating time of approximately 110 hours. The engine was tested while operating at the following steady-state modes:

Speeds: 850; 1,000; 1,600; 1,800; 2,200; 2,600; 3,000; 3,500 rpm

Loads: 0, 10, 25, 40, 60, 75, 90, 100 pct of full load  
(Repeated at 10, 25, 40, 75, 100 pct of full load for  
all speeds except 3,500 rpm)

Idle speed loads: 0, 1.5, 3.0 bhp (Repeated at each condition)

Total number of test modes..... 70  
Total repeats..... 41  
Total number of tests..... 111.

The following data were recorded at each test point:

Test number  
Date  
Barometric pressure, mm Hg  
Dewpoint, °F  
Inlet air temperature, °F  
Speed, rpm  
Torque, lb-ft -- BLH strain gage load cell; Daytronics indicator  
Fuel rate, lb/hr -- Fluidyne positive displacement fuel flowmeter  
Ignition timing, °BTC  
Manifold vacuum, in. Hg  
Throttle angle, deg  
CO, pct -- Beckman NDIR

$\text{CO}_2$ , pct - Beckman NDIR  
 $\text{O}_2$ , pct -- Beckman polarographic detector  
 $\text{HC}$ , ppmC -- Custom-built heated flame ionization detector  
 $\text{NO}_x$ , ppm -- Thermo-Electron chemiluminescent detector  
 Oil temperature,  $^{\circ}\text{F}$   
 Oil pressure, psig  
 Coolant temperature,  $^{\circ}\text{F}$   
 Exhaust temperature,  $^{\circ}\text{F}$   
 Exhaust pressure, in.  $\text{H}_2\text{O}$   
 Intake manifold temperature,  $^{\circ}\text{F}$ .

The computed data include absolute humidity (grains per pound dry air), power (bhp), air-fuel ratio (includes air injection), and emission rates of carbon monoxide ( $\text{CO}$ ), unburned hydrocarbons ( $\text{HC}$ ), and oxides of nitrogen ( $\text{NO}_x$ ) in grams per hour. The following equations were applied in the computations:

$$W = \exp 12.02 \left( \frac{D - 1.4}{D + 212} \right),$$

$$H = \frac{4348 W}{B - W},$$

$$P = \left( \frac{N \times T}{5252} \right) \left( \frac{736.6}{B - W} \right) \left( \frac{t + 460}{545} \right)^{0.5},$$

$$A/F = 4.895 \frac{(CO) + 2(CO_2) + 2(O_2) + \left( \frac{NO_x}{10^4} \right) + 3.148(CO_2) \left( \frac{CO + CO_2}{CO + 3CO_2} \right)}{(CO) + (CO_2) + \left( \frac{HC}{10^4} \right) 1 + 0.03148(CO_2) \left( \frac{CO + CO_2}{CO + 3CO_2} \right)}.$$

The equation for  $A/F$  is based on:

$$\text{Fuel} = \text{CH}_{2.099},$$

$$\text{Water-gas-shift equilibrium constant} = \frac{(CO)(H_2O)}{(CO_2)(H_2)} = 3,$$

$\text{HC}$  was determined on a raw exhaust, wet basis, all other species measured on a dry basis.

$$\text{Mass CO} = \left( \frac{M_{\text{ex}}}{C_w} \right) \left( \frac{\text{CO}}{100} \right) \left( \frac{MW_{\text{CO}}}{MW_{\text{ex}}} \right) 453.59237,$$

where  $MW_{\text{CO}}$  = molecular weight of CO (=28.01115),  
 $MW_{\text{ex}}$  = molecular weight of exhaust gas (=28.967),

$$C_w = \text{correction for water removal} = 1 + \frac{\left( \frac{x}{2} \right) (\text{CO} + \text{CO}_2) - \text{H}_2}{100}$$

$$\text{Mass HC} = 0.0002207 (F) (A/F + 1) (\text{HC}),$$

$$\text{Mass NO}_x = 0.0007201 (F) (A/F + 1) (\text{NO}_x) \left[ \frac{1}{1 + 0.03148 (\text{CO}_2) \left( \frac{\text{CO} + \text{CO}_2}{\text{CO} + 3\text{CO}_2} \right)} \right] (K_H),$$

where  $K_H$  is the humidity correction factor (dimensionless).

$$K_H = \frac{1}{1 - 0.0047 (H - 75)},$$

where  $A/F$  = air-fuel ratio

$B$  = barometric pressure, mm Hg

$\text{CO}$  = carbon monoxide concentration, pct, vol

$\text{CO}_2$  = carbon dioxide concentration, pct, vol

$D$  = intake air dew point, °F

$F$  = fuel rate, lb/hr

$H$  = humidity, grains  $\text{H}_2\text{O}$ /lb dry air

$\text{HC}$  = unburned hydrocarbon concentration, ppmC; vol

$K_H$  = humidity correction factor

$N$  = engine speed, rpm

$\text{NO}_x$  = nitrogen oxides concentration, ppm, vol

$\text{O}_2$  = oxygen concentration, pct, vol

P = corrected power, brake horsepower

t = intake air temperature, °F

T = torque, ft-lb

W = water vapor pressure, mm Hg.

### 3. DISCUSSION OF TEST RESULTS

Engine performance at wide-open-throttle (WOT) showed that the peak torque and brake horsepower values produced by the test engine (figure 1) were slightly in excess of those figures quoted in table 1. The brake specific fuel consumption at WOT showed some variability, possibly due to slight fuel metering inaccuracy. Air-fuel ratio was found to be repeatable over the entire operating range of the engine (figure 2). The values for air-fuel ratio, however, do not reflect the actual stoichiometry in the combustion chamber due to the influence of the air-injection system. Fuel consumption rates at engine speeds below 2,600 rpm show a typical dependence on power output (figure 3). At engine speed above 2,600 rpm and above power output levels of 75 pct of full load the rate of change of fuel consumption with power output becomes smaller. Emissions of HC and CO were maintained at low levels except near WOT conditions and also near no-load conditions for some engine speeds (figures 4 and 5). Maximum levels of NO<sub>x</sub> emissions occur typically at 90 to 100 pct of full load for each engine speed (figure 6).

The repeatability of emission rates, fuel consumption, and performance data are satisfactory for the purposes of this test.

#### 4. CONCLUSIONS

The purpose of the experimental work here is to establish data for this engine. Those data are presented in the tables accompanying this report.

TABLE 1. GENERAL ENGINE SPECIFICATIONS

Displacement.....	400 cu. in.
Maximum brake horsepower*.....	165 hp @ 3,500 rpm
Maximum torque*.....	329 ft-lb @ 1,800 rpm
Bore and stroke.....	4.00 in. x 4.00 in.
Configuration.....	90° V 8 cylinders
Compression ratio.....	8.0
Firing order.....	1-3-7-2-6-5-4-8
Ignition timing at idle speed**.....	12° BTC @ 650 rpm
Block material.....	Cast iron
Head material.....	Cast iron
Number of crankshaft mainbearings.....	5
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive.....	Chain
Valve lift:	
Intake.....	0.428 in.
Exhaust.....	0.433 in.
Valve port size:	
Intake.....	2.04 in.
Exhaust.....	1.65 in.
Valve timing:	
Intake, opens.....	17° BTC
Intake, closes.....	59° ABC
Exhaust, opens.....	65° BBC
Exhaust, closes.....	27° ATC
Spark plug gap.....	0.044 in.
Distributor specifications:	
Centrifugal advance begins <sup>+</sup> .....	1° @ 500 rpm
Centrifugal advance, intermediate <sup>+</sup> ..	4.5° @ 650 rpm
Centrifugal advance, intermediate <sup>+</sup> ..	8.375° @ 1,500 rpm
Centrifugal advance, full <sup>+</sup> .....	14° @ 2,500 rpm
Vacuum advance, begins <sup>+</sup> .....	0° @ 3 in. Hg
Vacuum advance, maximum <sup>+</sup> .....	15-1/2° @ 11-1/2 in. Hg
Exhaust gas recirculation system:	
Valve type.....	Tapered stem
Control signal.....	Manifold and venturi vacuum
Point of discharge.....	EGR spacer
Crankcase emission control:	
Control method.....	Positive crankcase ventilation
Point of discharge.....	Air cleaner
Carburetor type.....	2V downdraft

\* Average estimated net (SAE J-245).

\*\*Vacuum advance disconnected and plugged.

+ Distributor degrees at distributor rpm.

TABLE 2. ENGINE BREAK-IN SCHEDULE

Simulated Vehicle Speed, mph	Engine Speed, rpm	Manifold Vacuum, in. Hg	Fraction of Time in Mode
0	550	17.75	1/10
20	900	19.5	"
30	1,150	16.5	"
40	1,550	16	"
50	1,900	14.25	"
60	2,250	12.25	"
25	1,050	17.75	"
35	1,400	16.25	"
45	1,700	16	"
55	2,100	12.75	"

Mileage per cycle = 90 miles.

Total mileage accumulated over the 45-hour break-in period = 1,620 miles.

TABLE 3. FUEL SPECIFICATIONS

Fuel No.....	7602
Research octane No.....	91.5
Motor octane No.....	83.8
Reid vapor pressure, psig.....	11.9
Distillation, °F:	
10 pct.....	134
50 pct.....	214
95 pct.....	388
100 pct.....	418
API gravity, deg.....	67.0
FIA analysis, pct:	
Aromatics.....	11
Olefins.....	16
Paraffins.....	73
Sulfur, pct.....	0.024
Lead, g/gal.....	Trace
Hydrogen/carbon atomic ratio.....	2.09
Specific gravity.....	0.7126

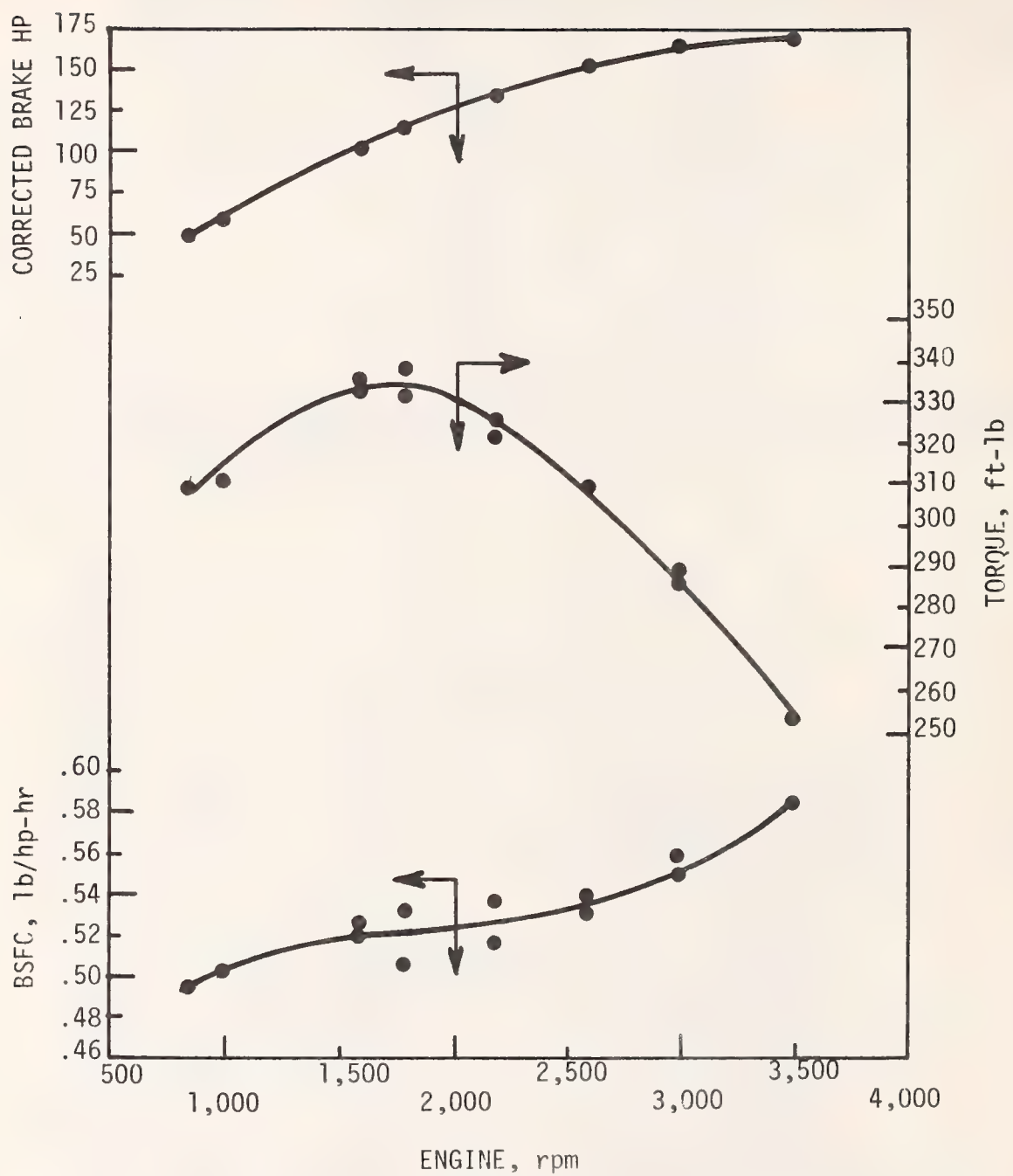


FIGURE 1. Brake Specific Fuel Consumption, Torque and Brake Horsepower versus Engine rpm at Wide-Open-Throttle--400-CID Ford Engine.

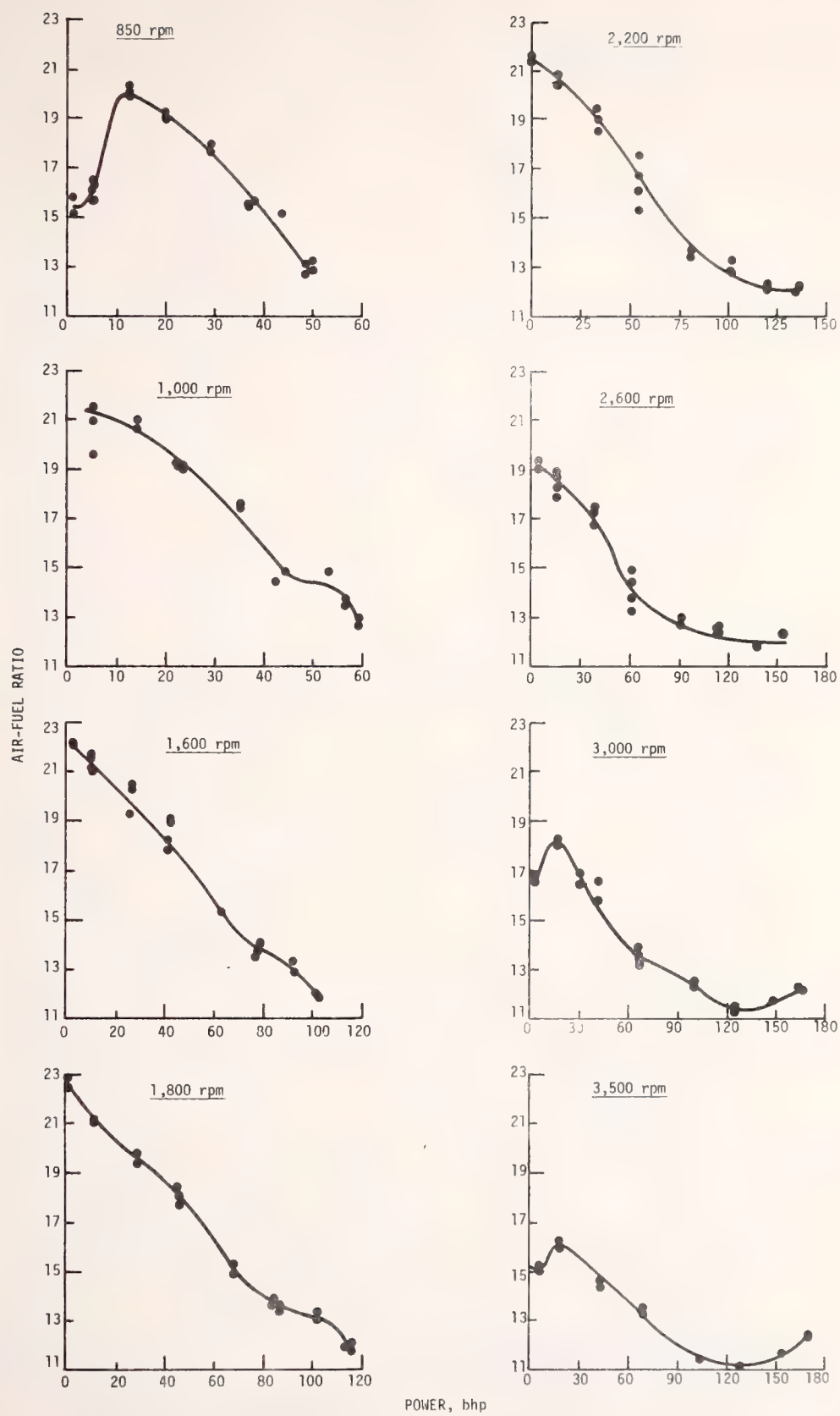


FIGURE 2. Air/Fuel Ratio versus Power at Various Speed and Load Conditions--400-CID Ford Engine.

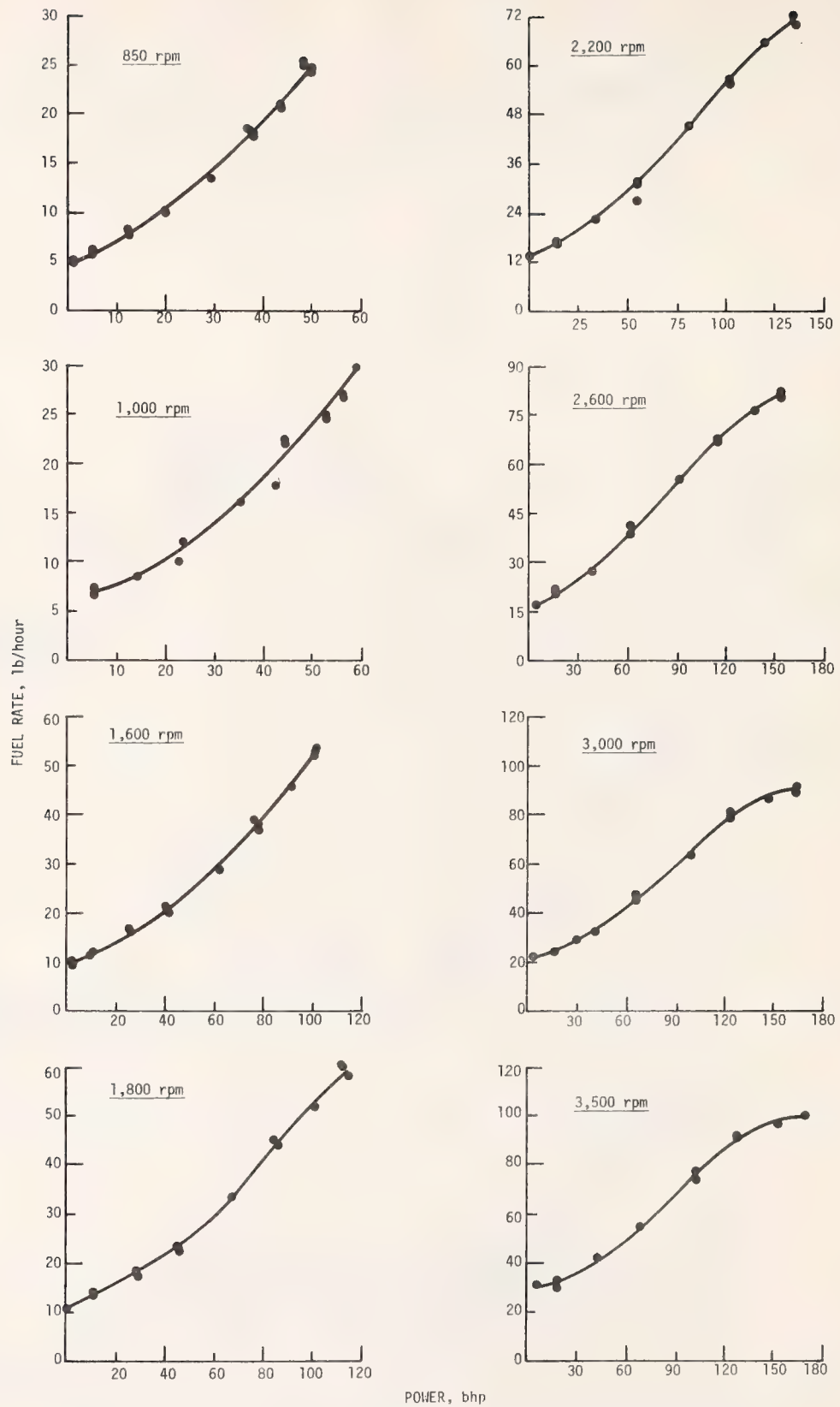


FIGURE 3. Fuel Rate versus Power at Various Speed and Load Conditions--400-CID Ford Engine.

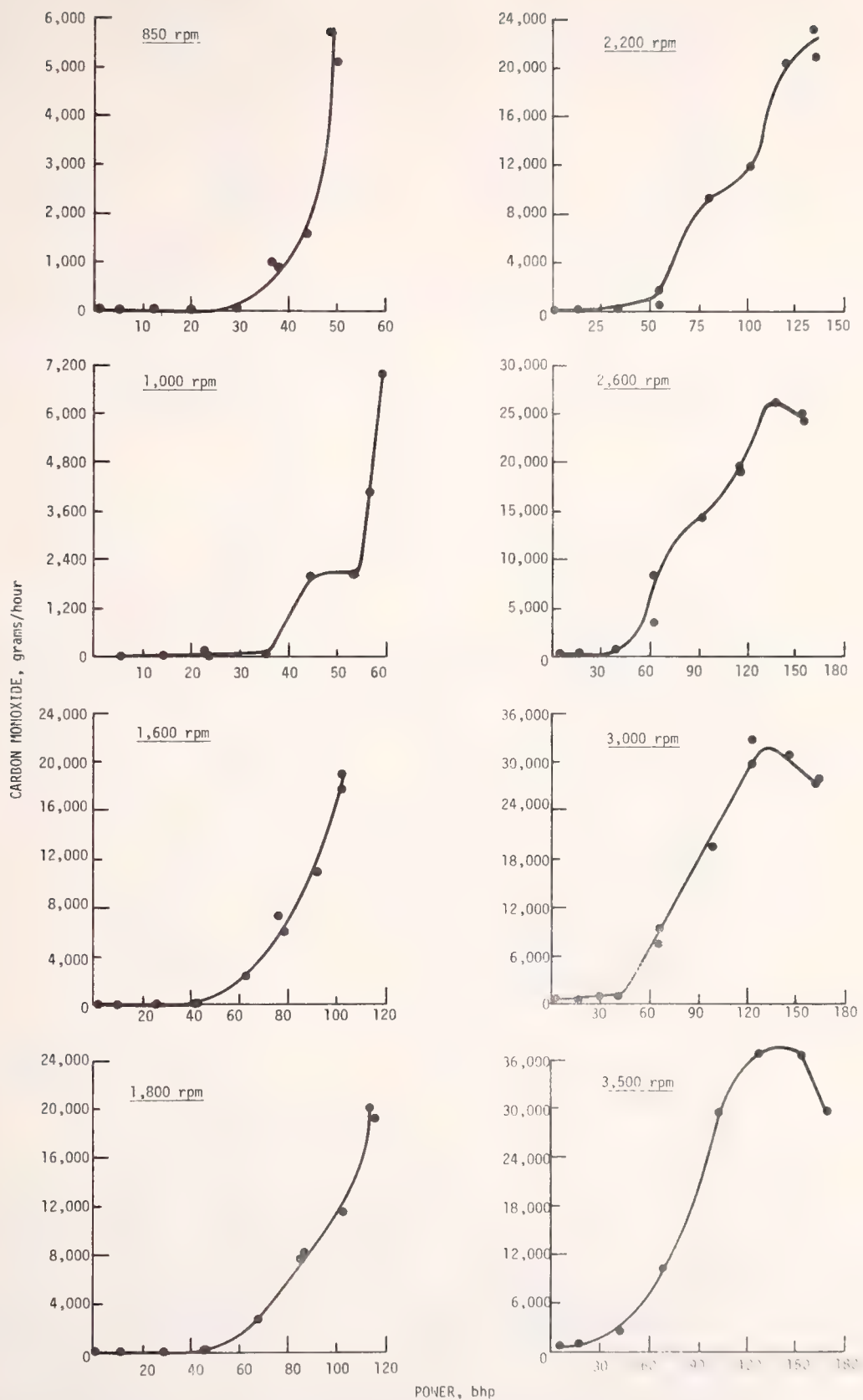


FIGURE 4. Carbon Monoxide Emissions versus Power at Various Speed and Load Conditions-- 400-CID Ford Engine.

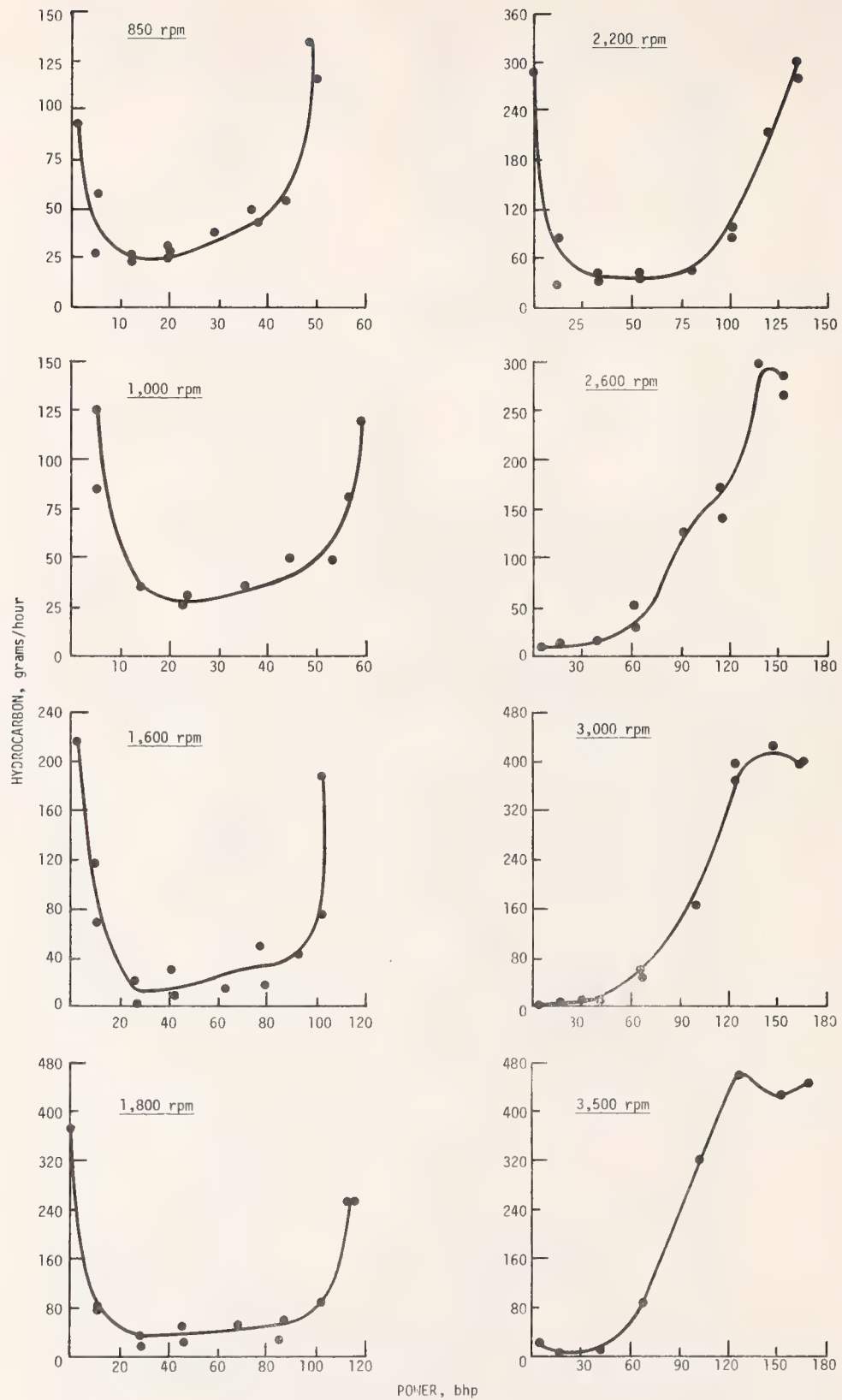


FIGURE 5. Hydrocarbon Emissions versus Power at Various Speed and Load Conditions--400 CID Ford Engine.

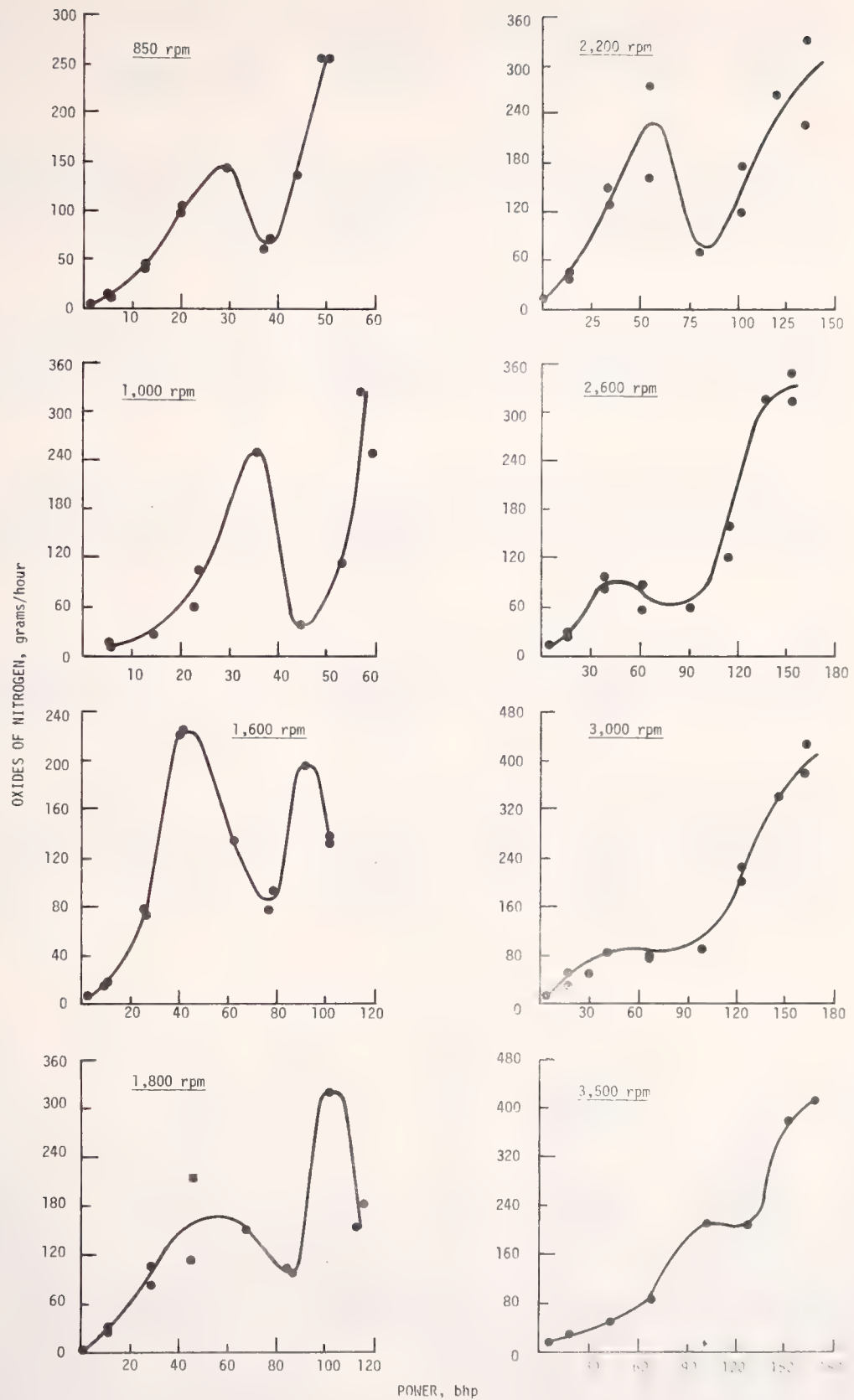


FIGURE 6. Oxides of Nitrogen Emissions versus Power at Various Speed and Load Conditions--400-CID Ford Engine.

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

1.1	1.2	2.1	2.2	3.1	3.2
6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76
744.3	744.3	744.3	744.3	744.3	744.3
59	59	59	59	59	59
92	92	82	82	82	82
650	650	650	650	650	650
.5	.5	10.0	10.0	20.0	20.0
.1	.1	1.2	1.2	2.5	2.5
3.6	3.6	4.2	4.2	4.1	4.2
39.0	39.0	38.0	38.0	38.0	38.0
20.0	20.0	20.0	20.0	19.5	19.5
.0	.0	.0	.0	.0	.0
157	157	123	123	121	121

#### CONCENTRATIONS, DRY BASIS

CO, %	.7000	.1671	.5250	.1420
CO2, %	11.11	12.25	12.75	12.87
O2, %	4.40	3.00	2.70	1.80
HC, PPMC	28022	11295	18670	5677
NOX, PPM	18	15	35	40

#### AIR/FUEL RATIO

14.65	15.71	14.47	15.48	14.69	15.49
-------	-------	-------	-------	-------	-------

#### EMISSION RATES, G/HR

CO	153.6	176.5	129.1	38.2
HC	309.9	237.2	140.9	77.0
NOX+	.6	1.4	2.5	1.7

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

186	182	184	184
26	27	27	27
187	187	183	183
13.0	20.0	5.0	1.0
361	377	390	471

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

#### AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

4.1	5.1	5.2	6.1	6.2
6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76
744.3	744.3	744.3	744.3	744.3
59	59	59	59	59
82	82	82	82	82
750	750	750	750	750
.2	10.2	10.2	20.0	20.0
.0	1.5	1.5	2.9	2.9
4.1	4.2	4.3	4.5	4.7
38.0	37.0	37.0	38.5	38.5
20.5	20.5	20.5	20.0	20.0
.0	.0	.0	1.0	1.0
122	121	121	153	153
1882	.7000	.2380	.5669	.1890
12.37	12.50	12.87	12.88	13.01
2.60	2.00	1.90	1.75	1.92
11306	14193	6817	8539	4549
17	46	27	85	78
15.42	14.46	15.38	14.93	15.67
49.1	177.4	64.5	157.8	57.3
148.6	181.3	93.1	119.8	69.5
.7	1.8	1.1	3.6	3.6
185	186	186	189	189
30	29	29	29	29
181	184	184	187	187
5.0	5.0	2.0	.0	.0
386	405	516	472	565

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

7.1	7.2	8.1	8.2	9.1	9.2
5/25/76	5/25/76	5/25/76	5/25/76	5/25/76	5/25/76
742.0	742.0	742.0	742.0	742.0	742.0
57	57	57	57	57	57
76	76	77	77	78	78
850	850	850	850	850	850
300.0	300.0	270.0	270.0	226.0	226.0
48.4	48.4	43.6	43.6	36.6	36.6
25.0	25.4	21.0	20.7	18.3	18.6
13.5	13.5	13.5	13.5	13.5	13.5
0	0	2.0	2.0	2.5	2.5
79.0	79.0	27.0	27.0	23.0	23.0
88	88	112	112	149	149

#### CONCENTRATIONS, DRY BASIS

4.8900	4.1800	2.0600	1.2400	1.5200	.8495
11.21	11.55	11.78	12.88	12.13	12.75
.12	.35	2.05	1.45	2.20	1.85
1892	1949	1364	834	1336	826
940	1235	1000	700	400	335

#### AIR/FUEL RATIO

12.70	13.13	15.21	15.23	15.57	15.71
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#### EMISSION RATES, G/HR

6399.7	5735.6	2711.7	1602.5	1781.3	1018.0
124.8	134.8	90.5	54.3	78.9	49.9
186.5	257.0	199.6	137.2	71.1	60.9

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

213	213	208	208	206	206
25	25	26	26	28	28
166	166	167	167	185	185
22.0	15.0	24.0	14.0	19.0	11.0
695	836	723	996	727	946

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

# CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

# EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

10.1	10.2	11.1	11.2	12.1	12.2
5/25/76	5/25/76	5/25/76	5/25/76	5/25/76	5/25/76
742.0	742.0	742.0	742.0	742.0	742.0
57	57	57	57	57	57
79	79	77	77	78	78
850	850	850	850	850	850
180.0	180.0	121.0	121.0	76.0	76.0
29.1	29.1	19.6	19.6	12.3	12.3
13.4	13.6	9.9	10.0	7.8	8.1
30.0	30.0	39.0	39.0	43.0	43.0
7.0	7.0	12.0	12.0	16.5	16.5
12.5	12.5	8.0	8.0	5.5	5.5
154	154	127	127	121	121
.1180	.0700	.0424	.0332	.0607	.0332
12.02	12.02	11.01	11.22	10.60	10.90
3.75	3.97	5.25	5.00	6.25	5.75
1166	754	1227	782	1333	813
1075	950	850	820	375	410
17.71	17.98	19.32	19.11	20.34	19.87
115.5	70.2	33.6	26.1	39.7	22.0
57.5	38.1	49.0	31.0	44.0	27.1
159.6	144.4	102.1	97.7	37.2	41.2
204	204	193	193	199	199
28	28	30	30	29	29
195	195	187	187	179	179
13.0	7.0	8.0	4.0	5.0	2.0
625	752	505	636	508	612

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

#### AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

13.1	13.2	14.1	14.2	15.1	15.2
5/25/76	5/25/76	5/25/76	5/25/76	6/ 9/76	6/ 9/76
742.0	742.0	742.0	742.0	744.3	744.3
57	57	57	57	59	59
79	79	79	79	82	82
850	850	850	850	1000	1000
30.0	30.0	7.8	7.8	310.0	310.0
4.9	4.9	1.3	1.3	59.1	59.1
5.9	5.8	4.9	5.0	29.7	29.6
42.0	42.0	41.0	41.0	18.5	18.5
19.5	19.5	20.5	20.5	.0	.0
4.0	4.0	3.0	3.0	78.5	78.5
118	118	118	118	91	91
2205	.0940	.4180	.1890	4.8900	4.3800
13.27	13.40	12.26	13.27	11.11	11.33
2.15	2.00	3.25	2.25	.07	.18
5701	1426	16965	5700	1633	1489
250	245	80	105	900	1025
15.68	16.12	15.15	15.76	12.68	12.96
84.0	36.0	127.6	61.3	7608.6	6920.2
109.5	27.5	261.0	93.2	128.0	118.6
14.4	14.2	3.7	5.2	214.8	248.4
198	198	195	195	214	214
30	30	32	32	27	27
181	181	188	188	195	195
1.0	.0	1.0	.0	27.0	16.0
475	575	427	599	729	852

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %

O<sub>2</sub>, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

16.1	16.2	17.1	17.2	18.1	18.2
6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76	6/ 9/76
744.3	744.3	744.3	744.3	744.3	744.3
59	59	59	59	59	59
82	82	82	82	83	83
1000	1000	1000	1000	1000	1000
279.0	279.0	233.0	233.0	185.0	185.0
53.1	53.1	44.4	44.4	35.3	35.3
24.6	24.2	22.1	21.8	15.7	15.8
18.5	18.5	20.0	20.0	38.5	38.5
2.0	2.0	2.8	2.8	7.5	7.5
29.0	29.0	23.0	23.0	13.0	13.0
120	120	161	161	161	161

2.3300	1.3500	2.6600	1.4800	.1125	.0700
11.78	12.88	11.55	12.75	12.26	12.26
1.67	1.00	1.99	1.05	3.40	3.47
1024	658	1280	743	1072	621
680	500	225	180	1400	1425
14.83	14.88	14.85	14.83	17.41	17.56

3494.0	1993.8	3586.5	1962.7	126.0	79.8
77.4	48.9	87.0	49.7	60.5	35.6
156.4	113.3	46.5	36.6	240.5	249.0

212	212	206	206	205	205
28	28	28	28	30	30
185	185	178	178	189	189
27.0	17.0	22.0	12.0	7.0	8.0
772	1032	734	1001	641	786

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

19.1	19.2	21.1	21.2	23.1	23.2
6/ 9/76	6/ 9/76	5/27/76	5/27/76	6/17/76	6/17/76
744.3	744.3	745.4	745.4	740.6	740.6
59	59	63	63	62	62
83	83	77	77	81	81
1000	1000	1000	1000	1600	1600
124.0	124.0	28.4	28.4	333.0	333.0
23.6	23.6	5.4	5.4	102.0	102.0
11.8	11.8	6.8	7.0	53.6	53.6
45.0	45.0	40.0	40.0	24.0	24.0
12.0	12.0	19.0	19.0	.0	.0
9.0	9.0	4.5	4.5	79.0	79.0
157	157	130	130	88	88

#### CONCENTRATIONS, DRY BASIS

CO, %	.0561
CO2, %	11.22
O2, %	4.93
HC, PPMC	1146
NOX, PPM	920

7.3900	7.1900
9.89	9.89
.08	.07
572	572
325	320

#### AIR/FUEL RATIO

18.99	18.91	19.55	20.96	11.79	11.84
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#### EMISSION RATES, G/HR

CO	52.1	404.3	37.1	19397.5	18959.9
HC	53.6	107.4	85.2	75.7	76.0
NOX+	131.0	103.6	15.9	132.1	130.6

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

202	206	230	230	230	230
32	30	33	33	33	33
175	186	196	196	196	196
11.0	3.0	69.0	69.0	48.0	48.0
598	672	864	864	1032	1032

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

## CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %O<sub>2</sub>, %

HC, PPMC

NOX, PPM

## AIR/FUEL RATIO

## EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

24.1	24.2	25.1	25.2	26.1	26.2
6/17/76	6/17/76	6/15/76	6/15/76	6/15/76	6/15/76
740.6	740.6	742.1	742.1	742.1	742.1
62	62	60	60	60	60
82	82	81	81	84	84
1600	1600	1600	1600	1600	1600
300.0	300.0	257.0	257.0	205.0	205.0
91.9	91.9	78.5	78.5	62.8	62.8
45.9	45.8	37.0	38.1	29.0	28.7
22.0	22.0	25.0	25.0	39.0	39.0
1.5	1.5	3.0	3.0	6.5	6.5
43.0	43.0	33.0	33.0	23.5	23.5
107	107	162	162	194	194
5.7700	4.3700	3.8600	2.7800	2.6200	1.3100
10.09	11.32	10.90	11.89	11.00	12.37
1.00	.53	1.35	.65	2.45	1.45
1025	344	410	171	764	171
470	500	320	270	570	480
12.83	13.26	13.93	14.01	15.26	15.27
1100.4	10923.2	8228.9	6111.3	4787.4	2358.5
126.3	43.3	44.0	19.0	70.4	15.5
177.8	193.5	104.7	91.1	159.9	132.7
234	234	234	234	231	231
35	35	35	35	36	36
191	191	192	192	189	189
63.0	50.0	58.0	38.0	38.0	25.0
892	1224	882	1215	767	1106

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

27.1	27.2	28.1	28.2	29.1	29.2
6/15/76	6/15/76	6/15/76	6/15/76	6/11/76	6/11/76
742.1	742.1	742.1	742.1	737.7	737.7
60	60	60	60	67	67
81	81	82	82	84	84
1600	1600	1600	1600	1600	1600
137.0	137.0	86.0	86.0	31.2	31.2
41.8	41.8	26.3	26.3	9.6	9.6
19.8	20.3	16.4	16.1	11.3	11.2
50.0	50.0	48.0	48.0	51.0	51.0
11.0	11.0	14.0	14.0	16.5	16.5
16.0	16.0	12.0	12.0	7.5	7.5
188	188	181	181	162	162

.0607	.0378	.0772	.0424	.1420	.0748
11.11	11.00	10.28	10.50	9.31	9.70
4.65	4.70	5.95	5.80	7.50	7.12
536	112	122	44	3844	2314
1025	912	375	355	88	95

18.87	19.04	20.44	20.24	21.67	21.46
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93.7	60.5	107.3	57.2	145.2	75.0
41.7	9.0	8.5	3.0	198.1	117.0
243.0	224.0	80.0	73.5	14.2	15.1

218	218	212	212	195	195
40	40	45	45	53	53
190	190	184	184	178	178
27.0	15.0	22.0	11.0	13.0	6.0
702	886	675	854	625	795

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

30.1	30.2	31.1	31.2	32.1	32.2
6/11/76	6/11/76	5/27/76	5/27/76	5/27/76	5/27/76
737.7	737.7	745.4	745.4	745.4	745.4
67	67	63	63	63	63
84	84	77	77	77	77
1600	1600	1800	1800	1800	1800
8.0	8.0	332.0	332.0	299.0	299.0
2.5	2.5	113.3	113.3	102.0	102.0
10.1	9.6	60.1	60.5	52.4	52.3
50.0	50.0	25.0	25.0	25.0	25.0
19.6	19.6	.2	.2	1.8	1.8
6.5	6.5	79.0	79.0	35.5	35.5
154	154	87	87	98	98

## CONCENTRATIONS, DRY BASIS

CO, %	6.7900	6.6800	5.3700	4.0000
CO2, %	9.89	10.09	10.50	11.66
O2, %	.08	.07	.90	.36
HC, PPMC	1770	1658	1142	608
NOX, PPM	335	330	750	715

## AIR/FUEL RATIO

22.16	22.07	11.87	11.94	12.97	13.31
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## EMISSION RATES, G/HR

CO	151.6	78.3	20175.0	20081.4	15104.3	11456.3
HC	467.4	216.0	265.0	251.2	161.8	87.7
NOX+	5.2	6.6	164.1	154.3	328.2	318.6

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

189	189	243	243	248	248
53	55	35	35	35	35
172	172	195	195	196	196
11.0	5.0	94.0	71.0	96.0	70.0
584	791	859	1085	928	1269

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

33.1	33.2	34.1	34.2	35.1	35.2
5/27/76	5/27/76	5/27/76	5/27/76	5/27/76	5/27/76
745.4	745.4	745.4	745.4	745.4	745.4
63	63	63	63	63	63
77	77	78	78	79	79
1800	1800	1800	1800	1800	1800
249.0	249.0	199.0	199.0	133.0	133.0
84.9	84.9	67.9	67.9	45.4	45.4
45.1	45.3	33.7	34.1	22.9	23.5
26.0	26.0	40.0	40.0	52.0	52.0
3.2	3.2	6.3	6.3	10.7	10.7
28.0	28.0	20.0	20.0	14.0	14.0
151	151	195	195	197	197

2.9600	1.2400	.1826	.0892
12.26	12.84	11.78	11.63
.50	1.50	4.04	4.38
218	503	871	572
255	455	1175	415

13.86	15.29	18.00	18.41
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7623.7	2642.2	310.6	158.7
28.3	54.0	74.7	51.3
102.2	150.8	310.9	114.9

242	239	234	234
36	37	40	40
196	195	195	195
57.0	36.0	33.0	21.0
1298	1173	743	954

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

## CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %O<sub>2</sub>, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

## EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

36.1	37.1	37.2	38.1	38.2
5/27/76	5/28/76	5/28/76	6/10/76	6/10/76
745.4	745.0	745.0	742.5	742.5
63	63	63	64	64
78	77	77	84	84
1800	1800	1800	1800	1800
84.0	34.0	34.0	3.0	3.0
28.7	11.6	11.6	1.0	1.0
18.2	13.6	14.0	11.1	11.1
52.0	49.0	49.0	52.0	52.0
14.0	17.0	17.0	19.7	19.7
11.0	9.0	9.0	8.0	8.0
189	152	152	160	160

.0940	.1325	.0772	.1650	.0892
10.74	9.70	9.89	8.10	8.64
5.65	7.00	6.75	9.00	8.50
946	2205	1380	9229	7091
510	160	170	15	41
19.77	21.28	21.17	22.84	22.51

139.8	160.3	94.9	177.0	93.4
70.9	134.4	85.5	499.1	374.1
118.0	30.1	32.5	2.5	6.7
226	217	217	210	210
43	46	46	50	50
193	189	189	188	188
22.0	16.0	11.0	13.0	8.0
703	629	648	602	815

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

39.1	40.1	40.2	41.1	41.2
5/28/76	5/28/76	5/28/76	5/28/76	5/28/76
745.0	745.0	745.0	745.0	745.0
63	63	63	63	63
77	77	77	81	81
2200	2200	2200	2200	2200
322.0	287.0	287.0	242.0	242.0
134.3	119.8	119.8	101.3	101.3
71.9	65.5	65.6	56.1	55.6
23.5	26.0	26.0	27.0	27.0
1.0	2.0	2.0	3.2	3.2
79.0	39.5	39.5	31.5	31.5
88	105	105	153	153

6.3600	6.0200	5.3700	3.9000
10.30	10.40	10.50	11.66
.04	.27	.80	.27
1373	1052	982	459
400	500	235	250
12.08	12.36	12.90	13.28

22990.8	20220.1	16106.9	11852.1
250.2	170.2	148.4	70.2
225.0	261.4	109.7	118.2
254	251	253	253
39	39	40	40
183	191	189	189
105.0	96.0	110.0	84.0
1162	1232	977	1321

ENGINE: FORD 400 CID  
FUEL CODE: 7602

TEST NUMBER	42.1	42.2	43.1	43.2	44.1	44.2
TEST DATE	5/28/76	5/28/76	6/10/76	6/10/76	5/28/76	5/28/76
BAROMETER, MMHG	745.0	745.0	742.5	742.5	745.0	745.0
HUMIDITY, GRAINS/LB	63	63	64	64	63	63
TEMPERATURE, F	81	81	82	82	79	79
ENGINE SPEED, RPM	2200	2200	2200	2200	2200	2200
TORQUE, FT-LB	193.0	193.0	130.0	130.0	80.0	80.0
POWER, BHP*	80.8	80.8	54.7	54.7	33.4	33.4
FUEL RATE, LB/HR	45.1	45.5	26.9	26.6	22.4	22.5
IGNITION TIMING, DEG BTDC	39.0	39.0	52.0	52.0	50.0	50.0
MANIFOLD VACUUM, IN HG	5.5	5.5	11.0	11.0	14.0	14.0
THROTTLE ANGLE, DEG	24.0	24.0	20.0	20.0	13.0	13.0
INTAKE MAN. TEMP., F	205	205	205	205	207	207

# CONCENTRATIONS, DRY BASIS

CO, %	5.0000	3.6400	.7570	.2416	.1650	.0820
CO2, %	10.09	11.55	11.66	11.66	11.01	10.90
O2, %	1.55	.80	3.00	3.50	5.00	5.25
HC, PPMC	783	280	620	360	726	390
NOX, PPM	195	175	950	900	510	525

# AIR/FUEL RATIO

	13.48	13.72	16.79	17.61	19.06	19.46
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# EMISSION RATES, G/HR

CO	12614.4	9345.5	1408.3	467.2	291.3	148.3
HC	99.6	36.3	58.1	35.0	64.6	35.6
NOX+	76.6	69.9	277.0	272.7	140.1	147.8

OIL TEMPERATURE, F	252	252	227	227	212	212
OIL PRESSURE, PSI	41	41	45	45	55	55
COOLANT TEMPERATURE, F	195	195	187	187	191	191
EXHAUST PRESSURE, IN. H2O	83.0	59.0	38.0	25.0	27.0	20.0
EXHAUST TEMPERATURE, F	896	1101	790	1020	661	882

\* CORRECTED SAE J8168  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %	15.11	45.1	45.2	46.1	46.2	47.1	47.2
CO <sub>2</sub> , %	9.99	5/28/76	5/28/76	6/10/76	6/10/76	5/28/76	5/28/76
O <sub>2</sub> , %	6.60	745.0	745.0	742.5	742.5	745.0	745.0
HC, PPMC	1382	63	63	64	64	63	63
NOX, PPM	200	80	80	87	87	87	87

#### AIR/FUEL RATIO

	20.87	20.88	21.44	21.62	12.35	12.32
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#### EMISSION RATES, G/HR

CO	213.3	112.2	288.5	122.3	23453.7	24068.4
HC	98.3	70.7	410.6	240.4	322.1	285.0
NOX+	43.9	43.9	8.7	12.2	373.3	310.0

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

	232	232	204	204	257	257
	50	50	63	63	44	44
	187	187	178	178	189	189
	22.0	14.0	16.0	10.0	182.0	154.0
	742	934	432	885	1002	1235

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

48.1	48.2	49.1	49.2	50.1	50.2
5/28/76	5/28/76	5/28/76	5/28/76	5/28/76	5/28/76
745.0	745.0	745.0	745.0	745.0	745.0
63	63	63	63	63	63
82	82	82	82	82	82
2600	2600	2600	2600	2600	2600
276.7	276.7	230.0	230.0	184.0	184.0
137.0	137.0	113.9	113.9	91.1	91.1
76.7	76.9	66.9	67.2	55.7	55.5
32.5	32.5	30.5	30.5	42.0	42.0
3.7	3.7	3.0	3.0	5.6	5.6
35.5	35.5	35.0	35.0	26.0	26.0
84	84	151	151	202	202

# CONCENTRATIONS, DRY BASIS

CO, %	6.7900	6.4300	5.5900	6.2100	4.7800
CO2, %	9.70	9.80	10.70	9.50	10.90
O2, %	.10	.55	.25	1.15	.45
HC, PPMC	1654	1367	973	1418	829
NOX, PPM	490	180	220	135	130

AIR/FUEL RATIO

11.79	11.89	12.26	12.53	12.64	12.96
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# EMISSION RATES, G/HR

CO	2559.9	21962.6	19481.9	18244.9	14217.7
HC	314.5	235.3	171.0	210.0	124.2
NOX+	287.7	95.7	119.3	61.7	60.2

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

255	255	247	247	246	246
43	43	45	45	45	45
192	192	191	191	195	195
149.0	110.0	138.0	109.0	108.0	80.0
974	1187	1006	1306	949	1312

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %  
CO<sub>2</sub>, %  
O<sub>2</sub>, %  
HC, PPMC  
NOX, PPM

#### AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO  
HC  
NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

51.1	51.2	52.1	52.2	53.1	53.2
5/28/76	5/28/76	5/28/76	5/28/76	5/28/76	5/28/76
745.0	745.0	745.0	745.0	745.0	745.0
63	63	63	63	63	63
82	82	82	82	82	82
2600	2600	2600	2600	2600	2600
123.8	123.8	77.0	77.0	31.0	31.0
61.3	61.3	38.1	38.1	15.4	15.4
38.7	38.4	27.9	27.6	20.5	20.4
55.0	55.0	56.0	56.0	56.0	56.0
10.6	10.6	14.2	14.2	17.7	17.7
19.0	19.0	15.0	15.0	11.0	11.0
205	205	215	215	218	218

.400	.400
11.01	11.01
4.75	4.75
201	201
110	110

18.65	18.84
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697.1	442.3
16.1	12.1
27.1	28.4

237	237
52	52
189	189
27.0	18.0
857	1064

.3756	.3756
11.78	11.78
3.45	3.45
146	146
315	315

17.44	18.84
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744.1	442.3
14.6	12.1
97.1	28.4

245	237
53	52
192	189
30.0	18.0
1132	1064

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

54.1	54.2	55.1	55.2	56.1	56.2
5/28/76	5/28/76	5/28/76	5/28/76	5/28/76	5/28/76
745.0	745.0	745.0	745.0	745.0	745.0
63	63	63	63	63	63
83	83	84	84	83	83
2600	2600	3000	3000	3000	3000
8.0	8.0	285.0	285.0	257.0	257.0
4.0	4.0	163.1	163.1	147.0	147.0
17.3	16.8	88.8	90.4	86.6	87.0
56.0	56.0	31.0	31.0	36.0	36.0
19.8	19.8	2.0	2.0	3.9	3.9
9.0	9.0	79.0	79.0	38.8	38.8
218	218	87	87	79	79

CONCENTRATIONS, DRY BASIS

CO, %	5.8600	5.7900	6.9500	7.1500
CO2, %	10.60	10.50	9.70	9.70
O2, %	.10	.17	.09	.07
HC, PPMC	1517	1270	1711	1484
NOX, PPM	605	520	530	510

AIR/FUEL RATIO

18.90	19.27	12.31	12.37	11.80	11.75
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EMISSION RATES, G/HR

CO	565.0	333.0	26516.3	29642.7	30500.2
HC	9.9	9.8	346.1	367.7	319.0
NOX+	12.2	12.9	426.0	351.8	338.5

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

234	234	268	268	266	266
60	60	46	46	45	45
189	189	194	194	190	190
22.0	13.0	218.0	194.0	188.0	160.0
858	1041	1061	1287	1008	1227

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

57.1	57.2	58.1	58.2	59.1	59.2
5/29/76	5/29/76	6/10/76	6/10/76	5/29/76	5/29/76
736.7	736.7	742.5	742.5	736.7	736.7
59	59	64	64	59	59
81	81	87	87	82	82
3000	3000	3000	3000	3000	3000
215.0	215.0	173.0	173.0	114.0	114.0
124.0	124.0	99.7	99.7	65.8	65.8
79.3	79.7	64.2	64.1	45.8	47.0
47.5	47.5	45.5	45.5	57.0	57.0
6.5	6.5	5.8	5.8	10.0	10.0
31.5	31.5	38.0	38.0	21.0	21.0
76	76	202	202	223	223

# CONCENTRATIONS, DRY BASIS

CO, %	7.7400	5.7900	3.8200	2.7200
CO2, %	9.11	11.11	11.33	12.26
O2, %	.13	.07	.88	.50
HC, PPMC	1706	1229	725	344
NOX, PPM	375	140	210	190

# AIR/FUEL RATIO

11.48	11.52	12.39	12.55	13.64	13.94
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# EMISSION RATES, G/HR

CO	29529.6	21764.2	19178.6	9832.9	7316.1
HC	328.0	204.2	124.8	94.1	46.6
NOX+	219.1	72.3	88.2	82.8	78.3

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

265	265	247	247	258	258
46	46	47	47	51	51
192	192	198	198	192	192
146.0	118.0	127.0	98.0	94.0	67.0
932	1157	997	1325	1037	1384

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %

O<sub>2</sub>, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX†

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B  
† CORRECTED FOR HUMIDITY

60.1	60.2	61.1	61.2	62.1	62.2
5/29/76	5/29/76	5/29/76	5/29/76	5/29/76	5/29/76
736.7	736.7	736.7	736.7	736.7	736.7
59	59	59	59	59	59
82	82	82	82	82	82
3000	3000	3000	3000	3000	3000
71.0	71.0	28.4	28.4	4.8	4.8
41.0	41.0	16.4	16.4	2.8	2.8
32.9	33.0	24.6	24.6	22.7	23.3
58.0	58.0	58.0	58.0	58.0	58.0
14.0	14.0	17.2	17.2	19.0	19.0
16.5	16.5	12.5	12.5	10.0	10.0
222	222	225	225	235	235
.8344	.4362	.3779	.2789	.9125	.3985
12.62	12.50	11.44	11.55	12.02	12.75
1.90	2.55	4.20	4.15	2.85	2.90
80	68	101	73	147	45
240	250	115	112	60	62
15.85	16.59	18.13	18.15	16.55	16.83
1784.7	980.4	694.8	513.6	1409.5	639.4
8.6	7.7	9.4	6.8	11.5	3.7
78.6	86.0	32.4	31.6	14.2	15.2
252	252	237	237	239	239
55	55	59	59	60	60
192	192	191	191	192	192
58.0	42.0	38.0	35.0	33.0	20.0
992	1266	907	1143	1024	1308

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

63.1	64.1	64.2	65.1	65.2
5/29/76	6/10/76	6/10/76	5/29/76	5/29/76
736.7	742.5	742.5	736.7	736.7
59	64	64	59	59
84	87	87	86	86
3500	3500	3500	3500	3500
250.0	227.0	227.0	188.0	188.0
168.7	152.6	152.6	127.1	127.1
98.6	96.3	95.5	90.4	91.5
34.0	42.0	42.0	51.5	51.5
2.4	4.4	4.4	6.2	6.2
79.0	54.0	54.0	37.0	37.0
85	82	82	83	83

#### CONCENTRATIONS, DRY BASIS

CO, %	7.8500	7.8800	8.7400	8.5200
CO2, %	10.50	9.89	8.74	8.74
O2, %	.11	.10	.10	.07
HC, PPMC	1544	1691	1819	1591
NOX, PPM	630	500	320	315

AIR/FUEL RATIO

12.41	11.61	11.61	11.11	11.16
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#### EMISSION RATES, G/HR

CO	28089.1	36463.6	36911.6	36586.8
HC	394.5	395.9	387.2	344.3
NOX+	489.1	364.0	206.9	207.1

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

285	252	252	279	279
46	47	47	47	47
195	197	197	193	193
252.0	218.0	194.0	185.0	157.0
1106	1049	1254	989	1207

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

66.1	66.2	67.1	67.2	68.1	68.2
6/10/76	6/10/76	5/29/76	5/29/76	5/29/76	5/29/76
742.5	742.5	736.7	736.7	736.7	736.7
64	64	59	59	59	59
88	88	84	84	100	100
3500	3500	3500	3500	3500	3500
152.0	152.0	101.0	101.0	62.0	62.0
102.3	102.3	68.2	68.2	42.4	42.4
76.4	73.4	54.7	54.7	41.7	41.4
59.0	59.0	60.0	60.0	61.0	61.0
9.6	9.6	10.0	10.0	13.5	13.5
38.2	38.2	24.0	24.0	23.5	23.5
86	86	205	205	239	239

## CONCENTRATIONS, DRY BASIS

CO, %	8.4500	8.4700	4.2400	3.4200	2.4800	.9810
CO2, %	9.50	9.40	11.11	12.02	12.13	13.53
O2, %	.15	.10	.65	.30	1.00	.25
HC, PPMC	1431	1372	657	425	371	57
NOX, PPM	420	385	195	185	130	128
AIR/FUEL RATIO	11.42	11.36	13.32	13.52	14.36	14.60

## EMISSION RATES, G/HR

CO	30698.2	29477.8	12756.7	10385.1	6094.7	2422.4
HC	262.0	240.7	99.6	65.0	46.0	7.1
NOX+	239.1	210.0	89.8	86.0	48.9	48.4
OIL TEMPERATURE, F	236	236	262	262	247	247
OIL PRESSURE, PSI	52	52	53	53	57	57
COOLANT TEMPERATURE, F	191	191	193	193	192	192
EXHAUST PRESSURE, IN. H2O	135.0	106.0	113.0	84.0	83.0	57.0
EXHAUST TEMPERATURE, F	951	1179	1067	1404	1092	1508

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

69.1	69.2	70.1	70.2	71.1	71.2
5/29/76	5/29/76	6/10/76	6/10/76	6/11/76	6/11/76
736.7	736.7	742.5	742.5	745.3	745.3
59	59	64	64	64	64
82	82	88	88	81	81
3500	3500	3500	3500	650	650
26.0	26.0	8.0	8.0	3	3
17.5	17.5	5.4	5.4	0	0
32.4	29.6	31.0	30.6	3.8	3.5
61.0	61.0	58.0	58.0	37.0	377.0
16.5	16.5	17.5	17.5	20.5	20.5
18.0	18.0	17.0	17.0	0	0
243	243	212	212	135	135

## CONCENTRATIONS, DRY BASIS

1.0900	1.7000	2.0830	9488
12.26	12.13	11.78	12.38
2.20	1.60	2.20	2.50
284	1138	19894	14765
90	50	17	12
15.92	15.06	13.48	14.62

## AIR/FUEL RATIO

## EMISSION RATES, G/HR

2305.1	3265.5	443.9	201.3
30.3	110.2	213.7	157.9
29.1	15.1	.6	.4

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

247	237	172	172
58	60	30	30
190	190	175	175
55.0	52.0	5.0	1.0
1082	1067	374	434

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %

O<sub>2</sub>, %

HC, PPMC

NOX, PPM

#### AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

72.1	72.2	73.1	73.2	74.1	74.2
6/ 1/76	6/ 1/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76
745.0	745.0	744.0	744.0	744.0	744.0
64	64	64	64	64	64
84	84	84	84	84	84
650	650	650	650	750	750
10.0	10.0	20.0	20.0	1.4	1.4
1.2	1.2	2.5	2.5	.2	.2
4.1	4.1	4.3	4.1	4.2	4.2
37.0	37.0	39.0	39.0	39.5	39.5
19.5	19.5	19.5	19.5	20.5	20.5
.5	.5	.5	.5	.0	.0
142	142	118	118	121	121

.3390	.1229	.6276	.1741	.5926	.1811
12.25	12.75	12.75	12.75	11.78	12.26
15.00	4.00	1.75	2.05	3.45	3.05
16955	8506	9100	6239	19725	11294
55	58	80	40	35	25
23.22	16.75	14.84	15.59	14.91	15.75

131.2	34.7	163.3	46.3	153.8	49.9
330.7	121.2	119.3	83.5	258.1	157.0
3.3	2.6	3.3	1.7	1.4	1.1

189	189	185	185	189	189
26	26	27	27	29	29
186	186	187	187	182	182
5.0	3.0	2.0	.0	2.0	.0
407	527	422	503	412	527

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

75.1	75.2	76.1	76.2	77.1	77.2
6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76
744.0	744.0	744.0	744.0	744.0	744.0
64	64	64	64	64	64
84	84	88	88	82	82
750	750	750	750	850	850
10.0	10.0	20.0	20.0	308.0	308.0
1.4	1.4	2.9	2.9	49.9	49.9
4.5	4.5	4.8	4.8	24.8	24.5
40.0	40.0	40.0	40.0	15.0	15.0
20.2	20.2	19.5	19.5	.0	.0
.5	.5	1.0	1.0	79.0	79.0
121	121	123	123	94	94
4400	1263	2533	8844	45800	38200
12.13	12.26	12.26	12.50	11.44	11.78
3.10	3.25	2.85	2.90	.20	.35
16947	10161	11299	5090	1894	1721
55	45	100	95	1100	1225
15.04	16.06	15.57	16.43	12.89	13.30
123.3	37.7	78.3	27.4	6019.2	5115.3
239.4	152.8	176.1	83.2	125.4	116.1
2.4	2.1	4.8	4.8	226.4	256.9
191	191	191	191	208	208
29	29	29	29	25	25
182	182	188	188	201	201
5.0	.0	5.0	.0	22.0	13.0
425	539	434	542	722	834

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

78.1	78.2	79.1	79.2	80.1	80.2
6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76	6/ 3/76
744.0	744.0	744.0	744.0	744.0	744.0
64	64	64	64	64	64
84	84	85	85	83	83
850	850	850	850	850	850
234.0	234.0	123.0	123.0	77.0	77.0
38.0	38.0	20.0	20.0	12.5	12.5
17.8	18.1	10.1	9.9	7.6	7.9
14.5	14.5	42.5	42.5	43.0	43.0
2.5	2.5	12.0	12.0	16.5	16.5
22.0	22.0	7.0	7.0	4.0	4.0
157	157	149	149	125	125

CONCENTRATIONS, DRY BASIS

CO, %	1.3300
CO2, %	12.02
O2, %	2.18
HC, PPMC	1191
NOX, PPM	450

.0748	.0700
10.60	10.70
5.90	5.70
1111	723
475	450

AIR/FUEL RATIO

15.77

19.90

EMISSION RATES, G/HR

CO	1524.0
HC	68.8
NOX+	80.7

47.4	45.6
35.5	23.8
47.1	45.9

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

206	201	199
36	27	29
186	186	186
19.0	8.0	5.0
736	569	511

199	199
29	29
186	186
5.0	5.0
589	511

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

#### CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

#### AIR/FUEL RATIO

#### EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

81.1	81.2	82.1	82.2	84.1	84.2
6/ 3/76	6/ 3/76	6/14/76	6/14/76	6/14/76	6/14/76
744.0	744.0	737.7	737.7	737.7	737.7
64	64	67	67	67	67
83	83	87	87	84	84
850	850	1000	1000	1000	1000
33.0	33.0	292.0	292.0	117.0	117.0
5.4	5.4	56.5	56.5	22.6	22.6
6.0	6.0	26.8	26.5	9.8	9.8
42.0	42.0	17.0	17.0	45.0	45.0
19.5	19.5	.0	.0	16.0	16.0
2.0	2.0	79.0	79.0	5.5	5.5
121	121	111	111	137	137
<hr/>					
1721	10748	3.3000	2.7200	2890	1603
13.01	13.01	12.87	13.26	10.90	11.11
2.50	2.40	.11	.11	5.12	5.12
8529	2841	1156	1070	1172	670
210	195	1250	1375	410	475
<hr/>					
15.65	16.29	13.49	13.74	19.01	19.14
<hr/>					
66.4	30.0	4859.2	4030.4	221.6	124.5
165.8	57.3	85.8	79.9	45.3	26.2
12.7	12.2	291.4	322.5	49.8	58.4
<hr/>					
196	196	225	225	190	190
30	30	25	25	35	35
186	186	190	190	178	178
5.0	.0	24.0	16.0	8.0	3.0
478	563	745	870	553	642

## ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

85.1	85.2	86.1	86.2	87.1	87.2
6/14/76	6/14/76	6/14/76	6/14/76	6/11/76	6/11/76
737.7	737.7	737.7	737.7	740.7	740.7
67	67	67	67	71	71
84	84	83	83	86	86
1000	1000	1000	1000	1600	1600
74.0	74.0	29.0	29.0	327.0	330.0
14.3	14.3	5.6	5.6	100.8	101.7
8.2	8.4	6.3	6.5	52.6	52.7
44.5	44.5	44.5	44.5	23.0	23.0
17.5	17.5	20.0	20.0	.0	.0
4.0	4.0	3.0	3.0	79.0	79.0
129	129	121	121	92	92

## CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %O<sub>2</sub>, %

HC, PPMC

NOX, PPM

.1084	.0561	.1132	.0538	6.6400	6.7700
9.89	10.35	9.11	9.60	10.09	9.99
7.00	6.37	8.00	7.50	.05	.05
3312	998	10412	4293	1429	1429
190	215	100	120	325	320

## AIR/FUEL RATIO

20.97	20.65	20.92	21.49	11.96	11.90
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## EMISSION RATES, G/HR

CO

HC

NOX+

77.2	40.2	62.9	31.2	17362.4	17667.1
119.0	36.0	291.8	125.6	188.4	187.9
21.4	24.4	8.8	11.0	137.1	134.8

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

185	185	184	184	230	230
37	37	40	40	32	32
174	174	172	172	192	192
5.0	2.0	5.0	2.0	72.0	50.0
527	618	472	613	882	1050

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO<sub>2</sub>, %

O<sub>2</sub>, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

88.1	88.2	89.1	89.2	90.1	90.2
6/11/76	6/11/76	6/11/76	6/11/76	6/11/76	6/11/76
740.7	740.7	740.7	740.7	740.7	740.7
71	71	71	71	71	71
88	88	87	87	87	87
1600	1600	1600	1600	1600	1600
248.0	248.0	132.0	132.0	83.0	83.0
76.6	76.6	40.7	40.7	25.6	25.6
38.9	38.9	20.9	20.5	16.6	16.6
24.0	24.0	50.0	50.0	47.0	47.0
3.0	3.0	11.0	11.0	14.0	14.0
34.0	34.0	16.0	16.0	12.0	12.0
156	156	191	191	184	184

3.3800	.0675	.0988	.0493
11.78	11.55	10.69	10.90
.50	3.95	5.00	4.95
458	392	779	334
215	890	370	360

13.63	17.74	18.14	19.23
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7372.3	238.2	103.7	65.1
50.3	56.2	30.4	22.2
75.7	236.6	220.8	76.7

224	214	206	206
35	40	45	45
191	186	185	185
40.0	27.0	19.0	11.0
1231	742	696	855

ENGINE: FORD 400 CID  
FUEL CODE: 7602

TEST NUMBER	91.1	91.2	92.1	92.2	93.1	93.2
TEST DATE	6/14/76	6/14/76	6/16/76	6/16/76	6/14/76	6/14/76
BAROMETER, MMHG	737.7	737.7	741.1	741.1	737.7	737.7
HUMIDITY, GRAINS/LB	67	67	61	61	67	67
TEMPERATURE, F	81	81	85	85	88	88
ENGINE SPEED, RPM	1600	1600	1800	1800	1800	1800
TORQUE, FT-LB	33.0	33.0	335.0	335.0	249.0	249.0
POWER, BHP*	10.2	10.2	115.7	115.7	86.8	86.8
FUEL RATE, LB/HR	11.9	11.9	58.5	58.6	44.4	44.4
IGNITION TIMING, DEG BTDC	52.0	52.0	25.0	25.0	26.0	26.0
MANIFOLD VACUUM, IN HG	18.0	18.0	.5	.5	3.0	3.0
THROTTLE ANGLE, DEG	8.0	8.0	79.0	79.0	36.0	36.0
INTAKE MAN. TEMP., F	153	153	92	92	168	168

#### CONCENTRATIONS, DRY BASIS

CO, %	1373	0748	7.5200	6.5400	4.7800	3.3000
CO2, %	9.79	9.97	10.29	10.29	10.39	12.01
O2, %	7.00	6.50	.07	.07	1.20	.40
HC, PPMC	2758	1326	1724	1718	1058	470
NOX, PPM	100	107	400	400	250	245
AIR/FUEL RATIO	21.10	20.89	11.75	12.02	13.35	13.62

#### EMISSION RATES, G/HR

CO	143.3	77.3	21413.6	19126.4	11754.5	8202.1
HC	145.1	69.0	247.5	253.2	131.1	58.9
NOX+	16.5	17.5	176.3	181.0	97.3	96.4
OIL TEMPERATURE, F	192	192	245	245	231	231
OIL PRESSURE, PSI	50	50	35	35	36	36
COOLANT TEMPERATURE, F	187	187	194	194	196	196
EXHAUST PRESSURE, IN. H2O	13.0	7.0	88.0	64.0	72.0	49.0
EXHAUST TEMPERATURE, F	646	814	888	1080	906	1270

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

94.1	94.2	95.1	95.2	96.1	96.2
6/14/76	6/14/76	6/14/76	6/14/76	6/14/76	6/14/76
737.7	737.7	737.7	737.7	745.8	745.8
67	67	67	67	59	59
88	88	86	86	82	82
1800	1800	1800	1800	1800	1800
133.0	133.0	84.0	84.0	33.0	33.0
46.3	46.3	29.2	29.2	11.3	11.3
23.1	22.2	17.6	18.0	13.3	13.4
49.0	49.0	52.0	52.0	51.0	51.0
11.0	11.0	14.5	14.5	17.7	17.7
17.0	17.0	13.0	13.0	10.0	10.0
204	204	186	186	178	178

CONCENTRATIONS, DRY BASIS

CO, %	.1012	.0988	.0515	.1511	.0748
CO2, %	12.25	11.21	11.21	9.70	9.79
O2, %	3.80	5.30	5.20	7.00	6.75
HC, PPMC	723	335	268	2205	1323
NOX, PPM	975	400	375	130	150

AIR/FUEL RATIO

17.69	18.01	19.37	19.34	21.26	21.24
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EMISSION RATES, G/HR

CO	336.9	166.5	139.1	177.5	88.8
HC	61.0	24.3	23.8	130.6	79.2
NOX+	258.6	214.9	89.2	23.4	27.3

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

227	227	208	208	202	202
40	40	45	45	53	53
191	191	192	192	178	178
30.0	18.0	22.0	13.0	16.0	8.0
742	924	697	875	672	847

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID  
FUEL CODE: 7602

TEST NUMBER	97.1	97.2	98.1	98.2	99.1	99.2
TEST DATE	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76
BAROMETER, MMHG	745.8	745.8	745.8	745.8	745.8	745.8
HUMIDITY, GRAINS/LB	59	59	59	59	59	59
TEMPERATURE, F	84	84	85	85	87	87
ENGINE SPEED, RPM	2200	2200	2200	2200	2200	2200
TORQUE, FT-LB	324.0	324.0	244.0	244.0	130.0	130.0
POWER, BHP*	135.8	135.8	102.3	102.3	54.6	54.6
FUEL RATE, LB/HR	70.1	70.2	55.0	55.9	31.5	30.7
IGNITION TIMING, DEG BTDC	26.0	26.0	28.0	28.0	53.0	53.0
MANIFOLD VACUUM, IN HG	.5	.5	3.0	3.0	11.0	11.0
THROTTLE ANGLE, DEG	79.0	79.0	44.0	44.0	21.0	21.0
INTAKE MAN. TEMP., F	98	98	162	162	221	221

#### CONCENTRATIONS, DRY BASIS

CO, %	5.8600	5.7800	3.8600	2.0300	.8344
CO2, %	10.50	10.40	11.66	11.66	12.26
O2, %	.12	.92	.32	2.15	2.30
HC, PPMC	1430	1114	527	681	295
NOX, PPM	750	345	370	530	515

#### AIR/FUEL RATIO

	12.32	12.82	13.33	15.35	16.16
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#### EMISSION RATES, G/HR

CO	20963.0	16872.8	11840.9	4042.3	1699.2
HC	257.9	163.9	81.5	68.4	30.3
NOX+	411.2	154.4	174.0	161.8	160.7

#### OIL TEMPERATURE, F

	249	232	232	222	222
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#### OIL PRESSURE, PSI

	38	43	43	49	49
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#### COOLANT TEMPERATURE, F

	199	181	181	172	172
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#### EXHAUST PRESSURE, IN. H2O

	127.0	108.0	80.0	49.0	32.0
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#### EXHAUST TEMPERATURE, F

	935	972	1316	842	1146
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- \* CORRECTED SAE J816B
- + CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

# CONCENTRATIONS, DRY BASIS

CO, %	100.1	100.2	101.1	101.2	102.1	102.2
CO <sub>2</sub> , %	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76
O <sub>2</sub> , %	745.8	745.8	745.8	745.8	745.8	745.8
HC, PPMC	59	59	59	59	59	59
NOX, PPM	85	85	85	85	85	85
	2200	2200	2200	2200	2200	2200
	81.0	81.0	81.0	81.0	81.0	81.0
	34.0	34.0	34.0	34.0	34.0	34.0
	22.6	22.7	17.1	16.6	82.2	82.5
	53.5	53.5	54.0	54.0	29.0	29.0
	14.0	14.0	17.5	17.5	1.0	1.0
	16.0	16.0	12.0	12.0	79.0	79.0
	221	221	215	215	96	96

# AIR/FUEL RATIO

	100.1	100.2	101.1	101.2	102.1	102.2
	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76
	745.8	745.8	745.8	745.8	745.8	745.8
	59	59	59	59	59	59
	85	85	85	85	85	85
	2200	2200	2200	2200	2200	2200
	81.0	81.0	81.0	81.0	81.0	81.0
	34.0	34.0	34.0	34.0	34.0	34.0
	22.6	22.7	17.1	16.6	82.2	82.5
	53.5	53.5	54.0	54.0	29.0	29.0
	14.0	14.0	17.5	17.5	1.0	1.0
	16.0	16.0	12.0	12.0	79.0	79.0
	221	221	215	215	96	96

# EMISSION RATES, G/HR

CO	100.1	100.2	101.1	101.2	102.1	102.2
HC	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76
NOX+	745.8	745.8	745.8	745.8	745.8	745.8
	59	59	59	59	59	59
	85	85	85	85	85	85
	2200	2200	2200	2200	2200	2200
	81.0	81.0	81.0	81.0	81.0	81.0
	34.0	34.0	34.0	34.0	34.0	34.0
	22.6	22.7	17.1	16.6	82.2	82.5
	53.5	53.5	54.0	54.0	29.0	29.0
	14.0	14.0	17.5	17.5	1.0	1.0
	16.0	16.0	12.0	12.0	79.0	79.0
	221	221	215	215	96	96

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

103.1	103.2	104.1	104.2	105.1	105.2
6/ 4/76	6/ 4/76	6/ 4/76	6/ 4/76	6/ 5/76	6/ 5/76
745.8	745.8	745.8	745.8	747.6	747.6
59	59	59	59	56	56
85	85	87	87	81	81
2600	2600	2600	2600	2600	2600
231.0	231.0	123.0	123.0	77.0	77.0
114.5	114.5	61.1	61.1	37.9	37.9
66.5	67.9	41.7	41.1	27.3	28.1
38.5	38.5	55.0	55.0	54.0	54.0
3.0	3.0	11.0	11.0	14.5	14.5
39.0	39.0	25.0	25.0	18.0	18.0
159	159	201	201	217	217

CONCENTRATIONS, DRY BASIS

CO, %	CO <sub>2</sub> , %	O <sub>2</sub> , %	HC, PPMC	NOX, PPM
6.2700	9.99	.55	1255	280
5.3700	10.70	.25	772	290
3.5500	11.55	.77	429	160
.6816	12.13	2.85	158	290
.4570	3.27	141	270	

AIR/FUEL RATIO

17.21

EMISSION RATES, G/HR

CO	HC	NOX+
21413.0	215.9	146.6
19045.8	138.0	157.6
8241.8	50.2	56.9
1277.2	15.0	82.2
910.5	14.2	81.4

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H<sub>2</sub>O

EXHAUST TEMPERATURE, F

249	249	216	226	226	226
46	46	58	54	54	54
188	188	179	195	195	195
138.0	109.0	49.0	44.0	29.0	29.0
1022	1321	1261	885	1129	1129

\* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID  
FUEL CODE: 7602

TEST NUMBER	106.1	106.2	107.1	107.2	108.1	108.2
TEST DATE	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76
BAROMETER, MMHG	747.6	747.6	747.6	747.6	747.6	747.6
HUMIDITY, GRAINS/LB	56	56	56	56	56	56
TEMPERATURE, F	81	81	81	81	82	82
ENGINE SPEED, RPM	2600	2600	3000	3000	3000	3000
TORQUE, FT-LB	31.0	31.0	290.0	290.0	218.0	218.0
POWER, BHP*	15.3	15.3	164.7	164.7	123.9	123.9
FUEL RATE, LB/HR	22.2	21.3	91.8	91.7	81.8	81.8
IGNITION TIMING, DEG BTDC	55.0	55.0	30.0	30.0	47.0	47.0
MANIFOLD VACUUM, IN HG	18.5	18.5	2.0	2.0	6.5	6.5
THROTTLE ANGLE, DEG	13.0	13.0	79.0	79.0	44.0	44.0
INTAKE MAN. TEMP., F	205	205	88	88	79	79

#### CONCENTRATIONS, DRY BASIS

CO, %	6276	3756	6.0000	5.8800	8.5200	8.3400
CO2, %	11.33	11.22	10.50	10.30	8.92	8.92
O2, %	4.00	4.20	.10	.08	.12	.07
HC, PPMC	202	168	1546	1268	1650	1422
NOX, PPM	75	95	665	600	330	340
AIR/FUEL RATIO	17.78	18.19	12.25	12.26	11.23	11.26

#### EMISSION RATES, G/HR

CO	1020.0	601.6	27957.0	27473.7	32862.5	32273.5
HC	16.6	13.6	363.0	298.5	320.8	277.3
NOX+	18.4	23.0	468.7	424.0	192.5	199.0
OIL TEMPERATURE, F	211	211	279	279	277	277
OIL PRESSURE, PSI	60	60	44	44	45	45
COOLANT TEMPERATURE, F	189	189	205	205	199	199
EXHAUST PRESSURE, IN. H2O	27.0	18.0	216.0	150.0	149.0	120.0
EXHAUST TEMPERATURE, F	888	1107	1062	1289	949	1162

\* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: FORD 400 CID

FUEL CODE: 7602

TEST NUMBER

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP\*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

# CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

# EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

\* CORRECTED SAE J816B  
+ CORRECTED FOR HUMIDITY

109.1	109.2	110.1	110.2	111.1	111.2
6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76	6/ 5/76
747.6	747.6	747.6	747.6	747.6	747.6
56	56	56	56	56	56
82	82	82	82	82	82
3000	3000	3000	3000	3000	3000
117.0	117.0	52.5	52.5	29.0	29.0
66.5	66.5	29.8	29.8	16.5	16.5
47.8	47.8	29.7	30.0	24.9	24.7
48.0	48.0	57.5	57.5	57.5	57.5
10.5	10.5	15.5	15.5	17.3	17.3
28.0	28.0	18.5	18.5	15.5	15.5
211	211	233	233	239	239
4.7800	3.3800	.7325	.4619	.3468	.2431
10.50	11.90	12.13	11.90	11.44	11.33
.90	.25	2.60	2.95	4.08	4.25
831	264	74	96	107	78
170	205	160	160	120	180
13.19	13.50	16.48	16.96	18.06	18.33
12492.2	8971.2	1474.7	966.9	642.5	454.7
109.5	35.3	7.5	10.1	10.0	7.4
67.2	82.3	48.7	50.7	33.6	50.9
259	259	237	237	234	234
54	54	61	61	61	61
189	189	178	178	178	178
94.0	68.0	52.0	34.0	41.0	26.0
1033	1406	976	1224	918	1152



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